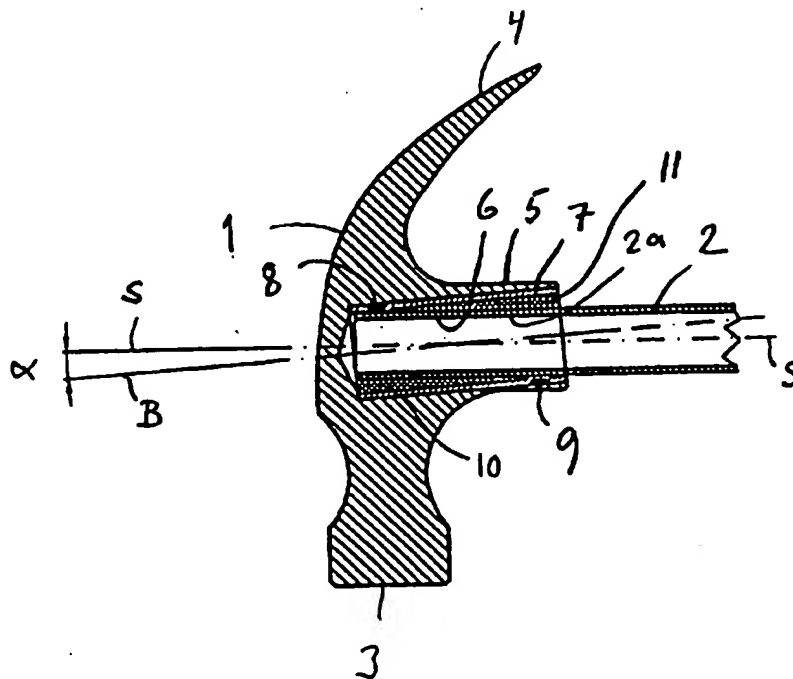




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B25D 1/12	A1	(11) International Publication Number: WO 97/10075 (43) International Publication Date: 20 March 1997 (20.03.97)
(21) International Application Number: PCT/SE96/01115 (22) International Filing Date: 6 September 1996 (06.09.96) (30) Priority Data: 9503124-1 11 September 1995 (11.09.95) SE (71) Applicant (for all designated States except US): HULTAFORS AB (SE/SE); S-517 96 Hultafors (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): HEDELIN, Joakim [SE/SE]; Hagåkersgatan 7C, S-431 41 Mölndal (SE). BROK, Hans [DK/DK]; Oramavej 2, DK-9100 Aalborg (DK). (74) Agents: MODIN, Jan et al.; Axel Ehmers Patentbyrå AB, P.O. Box 10316, S-100 55 Stockholm (SE).	(81) Designated States: NO, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	

(54) Title: SHOCK ABSORBING HAMMER



(57) Abstract

A shock absorbing hammer, comprising an elongated shaft (2) and a hammer head (1). An end portion (2a) of the shaft is obliquely oriented in a somewhat wider recess (6) in the hammer head (1) so as to permit a limited pivotal movement in one angular direction, the movement being damped by a shock absorbing material in said recess.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

Shock Absorbing Hammer

FIELD OF THE INVENTION

The present invention concerns a shock absorbing hammer,
5 comprising a shaft and a hammer head being provided with a
shock absorbing material, e.g. in the form of a rubber
material, a hydraulic cushioning material or the like, the
purpose being to dampen the rebound force and vibrations
imparted to the shaft when the hammer head hits an object
10 during a swinging motion of the hammer.

PRIOR ART

There are many examples of hammers of this general kind, see
e.g. US 2,451,217, US 3,172,438, US 4,085,784 and SE-B-462,616.
15 The last-mentioned document discloses a hammer, wherein an end
portion of the shaft is mounted in a recess in the hammer head
so as to permit a limited pivotal movement, being damped by a
shock absorbing material, in one angular direction from a rest
position when the hammer head strikes an object during a
20 swinging motion of the hammer, whereas mutual movement in the
opposite angular direction from said rest position is
inhibited. Accordingly, the hammer can either be used in the
normal way for striking an object, e.g. a nail, with the hammer
head or, alternatively, for withdrawing a fastener, e.g. a
25 nail, by means of a claw portion at the back of the hammer
head.

However, this known hammer is relatively complicated in its
structure, namely with radially projecting lugs formed at the
30 shaft end portion in order to ensure a direct surface contact
between the shaft and the hammer head inside the recess, the
latter being substantially parallel to but wider than the shaft
end portion. In some embodiments there are also internal,
especially adapted recess portions, in addition to a simple
35 cylindrical bore in the hammer head, which make the production
thereof even more complicated and expensive.

SUMMARY OF THE INVENTION

A primary object of the present invention is to accomplish a shock absorbing hammer of the kind defined in the preamble of claim 1 which has a simple structure and is inexpensive to manufacture and which provides an effective shock absorbtion.

This object is achieved in that the shaft end portion and the recess in the hammer head are both cylindrical, the cylindrical recess in the hammer head being obliquely inclined in relation to the cylindrical shaft end portion, so as to provide wedge-like upper and lower recess portions, which accommodate the shock absorbing material and permit a limited pivotal movement in one angular direction, and in that, in the rest position, the shaft end portion is in surface contact with the inside wall of the obliquely inclined cylindrical recess at diagonally opposite locations directly, i.e., without the intermediary of said shock absorbing material, whereby mutual movement in the opposite angular direction is inhibited.

The manufacture of a hammer according to the invention is simple. Thus, it is sufficient to make a downwardly inclined bore hole in the hammer head, as seen from the side of the shaft, and to insert the cylindrical shaft end portion, which has a smaller diameter, into the bore horizontally, so that the shaft end portion makes direct contact with the walls of the bore adjacent to the front end of the shaft, normally near the bottom of the hole, and adjacent to the opening of the bore, whereby the shaft end portion, and the central axis thereof, will extend at an angle, normally 3° - 10° , preferably about 4° , relative to the bore axis.

In this way, there will remain a lower recess portion with increasing vertical thickness from the location of contact near the opening of the hole to the bottom thereof, and an upper recess portion with increasing thickness in the opposite direction. These recess portions are shaped somewhat like a wedge, at least as seen in a vertical section, and are filled with a shock absorbing material. Because of this wedge-like

configuration, the dampening and shock absorbing power of the shock absorbing material will be uniform and effective along the full length of the shaft portion inserted into the cylindrical bore in the hammer head.

5

Preferably, the cylindrical bore in the hammer head is lined internally by a cylindrical sleeve, fitted tightly in the bore, so that the interior of the sleeve constitutes the recess into which the shaft end portion is inserted. Advantageously, the sleeve is made of metal and is provided with deformed portions near its ends, at the upper side near the bottom of the bore and at the lower side near the opening of the bore, these deformed portions extending radially inwards so as to provide the desired surface contact between the recess and the shaft end portion.

15

These and other optional features are stated in the dependant claims and will also appear from the detailed description below.

20

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described further with reference to the appended drawing illustrating a preferred embodiment.

25

Fig. 1 is a sectional view of the hammer head and the shaft end portion of a hammer according to the invention;

30

Fig. 2 shows a sleeve separately in longitudinal section along the line A-A in fig. 3, the sleeve forming a part of the connection between the shaft and the hammer head; and

Fig. 3 shows an end view of the sleeve of fig. 2.

DESCRIPTION OF A PREFERRED EMBODIMENT

35

The illustrated hammer comprises a conventional hammer head 1 which is resiliently connected to an end portion 2a of a tubular shaft 2, e.g. made of metal or a reinforced plastic material. The other end of the shaft (not shown in fig. 1) is

provided with a gripping handle, as is well-known in the art of hand tools of this kind.

The hammer head has a lower striking surface 3 and an upper
5 claw portion 4, the latter being used for withdrawing nails or
the like. A mid-portion of the hammer head 1 includes a
substantially cylindrical portion 5 projecting backwards in
parallel to the axis S of the shaft 2, to the right in fig. 1,
to provide a secure connection with the shaft 2. A cylindrical
10 bore 6, the diameter of which is somewhat larger than the
external diameter of the tubular shaft 2, is made at a small
angle α , about 4° in the illustrated embodiment, so that the
bore axis B is slightly inclined downwards towards the front
end, to the left in Fig. 1, relative to the horizontal axis S
15 of the shaft 2 and the hammer head portion 5.

A bushing or sleeve 7 (compare figs. 2 and 3), made of a metal
material, preferably steel, is press-fitted into the bore 6, so
that the interior of the sleeve constitutes a cylindrical
20 recess firmly integrated with the hammer head 1. The shaft 2 is
inserted with its end portion 2a into this recess, the axis S
thereof being oriented horizontally or in parallel to the
cylindrical, backwardly projecting portion 5 of the hammer head
1. Consequently, the forward, upper end of the shaft end
25 portion 2a makes direct contact with the innermost end 7a of
the sleeve 7 and the rear, lower end of the shaft end portion
2a makes direct contact with the outer end 7b of the sleeve.
This contact is well-defined and distributed over a surface
area by means of inwardly deformed material portions 8 and 9,
30 respectively, at each location.

Because of the inclinational angle α between the sleeve 6 and
the shaft end portion 2a, there are formed wedge-like recess
portions 10 and 11 between the inside of the sleeve 7 and the
35 outside of the shaft end portion 2a, the thickness increasing
towards the bottom of the recess at the lower side (10) and in
the opposite direction at the upper side (11). Of course, in
the circumferential direction, the thickness of these recess

portions will increase downwards at the front end 7a of the sleeve and upwards at the rear end 7b of the sleeve 7. The recess portions 10 and 11 are filled with a shock absorbing material, e.g. of rubber, foam, an elastically resilient plastic material or the like, which secures a permanent connection between the hammer head 1 and the shaft 2, on one hand, and provides the desired shock absorbing effect therebetween, on the other hand.

During use in the normal way, when the hammer strikes an object such as a nail, the hammer head 1 will be retarded and bounce back upwards, whereas the shaft 2, which is held in the hand of the user, still has a momentum directed downwards. The mutual movement is such that the hammer head 1 will impart an upwardly directed force onto the shaft end portion 2a at the location of direct surface contact with the deformed material portion 9, at the rear end of the shaft end portion 2a. Because of the relative upward movement of the hammer head 1, the latter will perform a pivotal movement around the last-mentioned location of direct contact. This relative pivotal movement will be effectively damped and retarded by the shock absorbing material in the wedge-like recess portion 10. During this process, a large part of the kinetic energy will be absorbed and be transformed into thermal energy. Therefore, the shock impact onto the shaft and handle of the hammer will be considerably reduced.

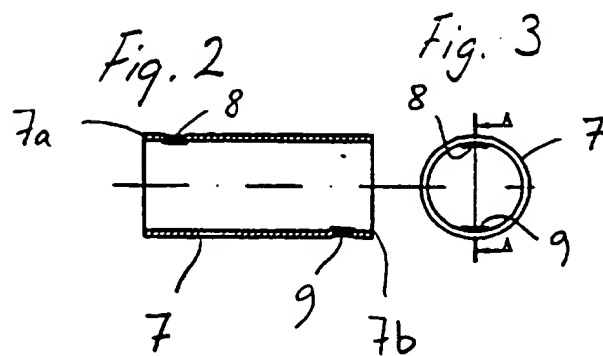
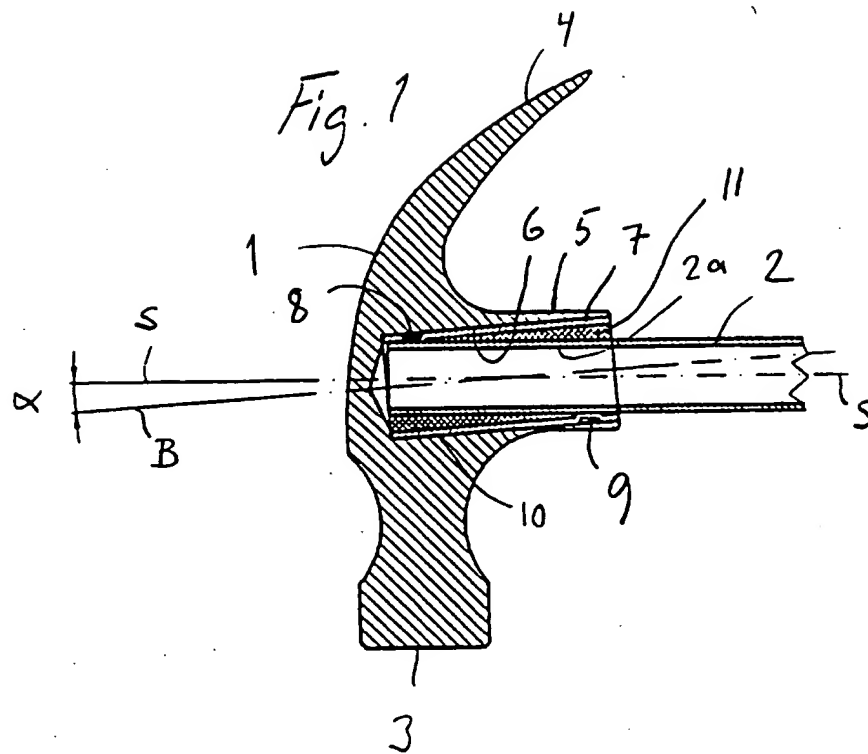
The structure of the hammer according to the invention may be modified by those skilled in the art within the scope of the appended claims. For example, the "cylindrical" shape of the hammer head recess and the shaft end portion includes also non-circular cross-sectional configurations, e.g. a rectangular cross-section. The crucial feature is the obliquely inclined orientation of the shaft end portion within the hammer head recess.

CLAIMS

1. Shock absorbing hammer, comprising an elongated shaft (2) and a hammer head (1), an end portion (2a) of the shaft being
5 mounted in a recess (6) in the hammer head so as to permit a limited pivotal movement, being damped by a shock absorbing material, in one angular direction from a rest position when the hammer head strikes an object during a swinging motion of the hammer, whereas mutual movement in the opposite angular
10 direction from said rest position is inhibited, c h a r a c - t e r i z e d i n that the shaft end portion (2a) and said recess (6) in the hammer head (1) are both cylindrical, the cylindrical recess (6) in the hammer head being obliquely inclined in relation to the cylindrical shaft end portion (2a),
15 so as to provide wedge-like upper and lower recess portions (11,10), which accommodate said shock absorbing material and permit said limited pivotal movement in said one angular direction, and in that, in said rest position, the cylindrical shaft end portion (2a) is in surface contact with the inside
20 wall (7) of the obliquely inclined cylindrical recess (6,7) at diagonally opposite locations (7a,8,7b,9) directly, i.e., without the intermediary of said shock absorbing material, whereby mutual movement in the opposite angular direction is inhibited.
- 25
2. Shock absorbing hammer as defined in claim 1, wherein a cylindrical sleeve (7) of a hard and wear-resistant material is inserted radially between the cylindrical shaft end portion (2a) and a cylindrical bore (6) in the hammer head (1), said
30 sleeve (7) having radially protruding portions (8,9) adjacent to its ends (7a,7b) providing said surface contact locations.
3. Shock absorbing hammer as defined in claim 2, wherein said cylindrical sleeve (7) is fitted tightly in said cylindrical
35 bore (6), the interior of said sleeve constituting said cylindrical recess.

4. Shock absorbing hammer as defined in claim 3, wherein said protrusions (8,9) extend radially inwards.
- 5 5. Shock absorbing hammer as defined in any one of claims 2-4, wherein said protrusions are constituted by deformed portions (8,9) of the sleeve material (7).
6. Shock absorbing hammer as defined in any one of claims 2-5, wherein said cylindrical sleeve (7) is made of metal.
- 10 7. Shock absorbing hammer as defined in any one of claims 1-6, wherein the shaft (2) is constituted by a cylindrical member of a strong material.
- 15 8. Shock absorbing hammer as defined in claim 7, wherein the cylindrical shaft (2) member is tubular.

1/1



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/01115

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B25D 1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B25D, B25G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CLAIMS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 462616 B (S. ERIKSLUND), 30 July 1990 (30.07.90), figure 1, details 17-19 -----	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

& document member of the same patent family

Date of the actual completion of the international search

8 January 1997

Date of mailing of the international search report

09 -01- 1997

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Henrik Bodin
Telephone No. +46 8 782 25 00

Information on patent family members

PCT/SE 96/01115

Form PCT/ISA/210 (patent family annex) (July 1992)